



# Leo<sup>LX4/5</sup>

Instrument User Manual V1.0



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your instrument  
online to receive  
your extended  
warranty.

Unrivaled Detection.

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## **Register your instrument online for extended warranty**

Thank you for purchasing your Ion Science product.

The standard warranty of your instrument can be extended to up to five years on the Tiger VOC detector and two years on other Ion Science instruments.

To receive your extended warranty, you must register your product online within one month of purchase (terms and conditions apply.)

Visit [www.ionscience.com/instrument-registration](http://www.ionscience.com/instrument-registration)

## **Statements**

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### **COPYRIGHT**

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### **LIABILITY**

Every care has been taken in the preparation of this Handbook, but Ion Science Inc do not accept any responsibility for errors or omissions and their consequences. Information in this Handbook is subject to change without notice. This Handbook does not constitute a specification or basis for a contract. Your statutory rights under law are not affected.

### **MODIFICATION NOTICES**

Ion Science Inc aim to notify customers of relevant changes in the product operation and maintain this Handbook up to date. In view of the policy of continuous product improvement there may be operational differences between the latest product and this Handbook.

This Handbook is an important part of the LEO product. Please note the following points:

- It should be kept with the instrument for the life of the product
- Amendments should be attached to this Handbook
- This Handbook should be passed on to any subsequent owner/user of the instrument
- Although every care is taken in the preparation of this Handbook it does not constitute a specification for the instrument.

### **SOFTWARE**

Software supplied on EPROM or similar device for use in a particular product, may only be used in that product and may not be copied without the written permission of Ion Science Inc. Reproduction or disassembly of such embodied programmes or algorithms is prohibited. Ownership of such software is not transferable and Ion Science Inc does not warrant that the operation of the software will be error free or that the software will meet the customer's requirements.

### **DISPOSAL ADVICE**

When no longer in use, dispose of the instrument carefully and with respect for the environment. Ion Science Inc will dispose of the instrument without charge if returned to the factory.

### **SAFETY**

- The instrument must be regularly serviced and calibrated by fully trained personnel in a safe area.
- Batteries: Alkaline batteries or \*Rechargeable battery pack must be exchanged (\*and recharged) in a safe area and fitted correctly before use. Never use damaged batteries or expose to extreme heat. See Section 4 : OPERATOR MAINTENANCE.
- Only GMI replacement parts should be used.
- If the instrument detects gas, follow your own organisation's procedures and operational guidelines.
- Gas can be dangerous and care should always be taken in its use.
- This equipment is designed and manufactured to protect against other hazards as defined in paragraph 1.2.7 of Annex II of the ATEX Directive 94/9/EC

Any right of claim relating to product liability or consequential damage to any third party against GMI is removed if the above warnings are not observed.

### **AREAS OF USE**

Exposure to certain chemicals can result in a loss of sensitivity of the flammable sensor. Where such environments are known or suspected it is recommended that more frequent response checks are carried out. The chemical compounds that can cause loss of sensitivity include Silicones, Lead, Halogens and Sulphur. Do not use instrument in potentially hazardous atmospheres containing greater than 21% Oxygen.

## **Statements**

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### **STORAGE, HANDLING AND TRANSIT**

The batteries in the rechargeable pack contain considerable energy and care should be taken in their handling and disposal.

The instrument is designed to handle harsh environments. The instrument is sealed to IP65 and the sensing elements, sample inlet and charging socket sealed to IP54. If not subject to misuse or malicious damage, the instrument will provide many years of reliable service.

The instrument can contain electrochemical sensors. Under conditions of prolonged storage these sensors should be removed. The sensor contains potentially corrosive liquid and care should be taken when handling or disposing of the sensor, particularly when a leak is suspected.

There is no special precautions to be taken when the instrument is in transit.

### **WARRANTY**

ION Science Inc warrants the product to be free from defects in material and workmanship under normal use and service for a period of two years, beginning on the date of shipment to the buyer. This warranty extends only to the sale of new and unused products to the original buyer.

ION's warranty obligation is limited, at ION's option, to refund of the purchase price, repair or replacement of a defective product that is returned to a ION Science Inc. authorized service center within the warranty period. In no event shall ION's liability hereunder exceed the purchase price actually paid by the buyer for the Product.

This warranty does not include:

- a) fuses, disposable batteries or the routine replacement of parts due to the normal wear and tear of the product arising from use;
- b) any product which in ION's opinion, has been misused, altered, neglected or damaged, by accident or abnormal conditions of operation, handling or use;
- c) any damage or defects attributable to repair of the product by any person other than an authorized dealer, or the installation of unapproved parts on the product; or The obligations set forth in this warranty are conditional on:
- a) proper storage, installation, calibration, use, maintenance and compliance with the product manual instructions and any other applicable recommendations of ION Science Inc.;
- b) the buyer promptly notifying ION of any defect and, if required, promptly making the product available for correction. No goods shall be returned to ION until receipt by the buyer of shipping instructions from ION; and
- c) the right of ION to require that the buyer provide proof of purchase such as the original invoice, bill of sale or packing slip to establish that the product is within the warranty period.

THE BUYER AGREES THAT THIS WARRANTY IS THE BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. BW SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR BASED ON CONTRACT, TORT OR RELIANCE OR ANY OTHER THEORY.

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this warranty is held invalid or unenforceable by a court of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

Contacting ION Science Inc.

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Visit ION Science Inc. website at:

[www.ionscienceusa.com](http://www.ionscienceusa.com)

USA: 1-877-864-7710

## **Statements**

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### **SAFETY INFORMATION – READ FIRST**

Use the detector only as specified in this manual and the reference guide, otherwise the protection provided by the detector may be impaired. Read the following cautions before using the detector.

- **Warning:**

Substitution of components may impair Intrinsic Safety.

- **Caution:** For safety reasons, this equipment must be operated and serviced by qualified personnel only.

Read and understand the user manual completely before operating or servicing.

- Charge the detector before first time use. ION recommends the detector be charged after every workday.

- Calibrate the detector before first-time use and then on a regular schedule, depending on use and sensor exposure to poisons and contaminants. ION recommends calibrating at least once every 90 days (3 months).

- The combustible sensor is factory calibrated to 50% LEL methane. If monitoring a different combustible gas in the %LEL range, calibrate the sensor using the appropriate gas.

- Calibrate only in a safe area that is free of hazardous gas and in an atmosphere of 20.9% oxygen.

- It is recommended that the combustible sensor be checked with a known concentration of calibration gas after any exposure to contaminants/poisons such as, sulfur compounds, silicon vapors, halogenated compounds, etc.

- ION recommends to bump test the sensors before each day's use to confirm their ability to respond to gas by exposing the detector to a gas concentration that exceeds the alarm set points. Manually verify that the audible and visual alarms are activated. Calibrate if the readings are not within the specified limits.

- **Caution:** High off-scale readings may indicate an explosive concentration.

- Any rapid up scaling reading followed by a declining or erratic reading may indicate a gas concentration beyond the upper scale limit, which can be hazardous.

- Extended exposure of the ION Science Inc LEO to certain concentrations of combustible gases and air may stress a detector element that can seriously affect its performance. If an alarm occurs due to a high concentration of combustible gases, calibrate the detector. If necessary, replace the sensor.

- Protect the combustible sensor from exposure to lead compounds, silicones, and chlorinated hydrocarbons.

- Sensor exposure to certain organic vapors (such as leaded gasoline and halogenated hydrocarbons) may temporarily inhibit sensor performance. After exposure, a bump test or calibration is recommended.

- For use only in potentially explosive atmospheres where oxygen concentrations do not exceed 20.9% (v/v).

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## Introduction

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### GENERAL DESCRIPTION

The LEO combines quality, ruggedness and advanced technology in a user friendly, portable gas detector. Small and lightweight, it is suitably certified to recognised International Standards.

The LEO is used for confined space monitoring, for example, in sewers, underground piping or within tanks, and other personal monitoring applications. Its high intensity audible and bright visual alarms provide early warning of dangerous gas levels.

The instrument is operated via a single push button providing the user with a simple to use gas detector. From one (1) up to five (5) gases can be monitored from the following list:

Note: A four (4) gas version is also available. For details, contact Ion Science Inc.

- 0 to 100% LEL Hydrocarbons
- 0 to 25% Oxygen (O<sub>2</sub>)
- 0 to 100 ppm Hydrogen Sulphide (H<sub>2</sub>S)
- 0 to 1000 ppm Carbon Monoxide (CO)
- Dual Sensor - Hydrogen Sulphide (H<sub>2</sub>S) / Carbon Monoxide (CO). This sensor, with ppm ranges as above, can only be used with the LEO 5-Gas instrument.
- 0 to 30 ppm Sulphur Dioxide (SO<sub>2</sub>)
- 0 to 100 ppm Sulphur Dioxide (SO<sub>2</sub>)
- 0 to 10 ppm Chlorine (Cl<sub>2</sub>)
- 0 to 20 ppm Nitrogen Dioxide (NO<sub>2</sub>)
- 0 to 100 ppm Ammonia (NH<sub>3</sub>)
- 0 to 300 ppm Nitric Oxide (NO)
- 0 to 5% Carbon Dioxide (CO<sub>2</sub>)
- 0 to 100 ppm Phosphine\* (PH<sub>3</sub>)
- 0 to 20 ppm Benzene\* (C<sub>6</sub>H<sub>6</sub>)
- Volatile Organic Compounds\* (VOC) range = 0 to 100 ppm Isobutylene resolution = 0.1 ppm.

Note\*: The Photo Ionisation Detector (PID) type sensor is used for detection of PH<sub>3</sub>, C<sub>6</sub>H<sub>6</sub> and VOC gases in LEO (pumped) instruments.

For further details of PID in LEO, including response factors, refer to Appendix B in this handbook. The instrument display identifies the gas(es) the instrument is monitoring. An example of a five gas instrument display is shown in Fig. 1.2:



Fig. 1.2 (5-Gas) Display Example

## Introduction

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The display details the current gas readings and operational / status information (as shown above) or the instrument can be set up to display a simple 'OK' message.

Note: This Handbook describes the operation of a five gas instrument configured in the most common format. On other models, operation is similar to the example shown. Operational differences are highlighted if and where they exist. Configurable options are available that allow the instrument to be set up to suit your particular requirements. These options are detailed in *italic* text, where applicable, and are also detailed in the 'CONFIGURATION HANDBOOK'.

### FEATURES

The main features of the instrument are:

- Integral impact resistant housing.
- Single button user operation
- One (1), up to five (5) gases detected simultaneously. (A four gas version is also available).
- Alphanumeric display with screen light.
- High intensity audible and visual alarms
- Confidence signal (green LED's and/or sounder)
- Built-in electric pump (optional).
- Automatic data logging (optional)
- Three types of battery pack: Long Duration, Fast Charge, and Alkaline. Each type of pack provides a different operational lifetime. These times can be found in Table 1.1 and display battery life in hours, allowing five (5) minutes of alarm per day.
- Instrument sealed to IP65 and sensing elements, sample inlet and charging socket sealed to IP54, making the instrument suitable for outdoor use
- A comprehensive range of accessories

INSTRUMENT OPERATING MODE	BATTERY TYPE / LIFE	
	LONG DURATION / FAST CHARGE	ALKALINE
LEL	>16	>16
IR (INFRARED)	>16	>16
PUMP	>16	>16
LEL + IR	12	13
LEL + PUMP	12	13
IR + PUMP	15	>16
LEL + IR + PUMP	9	10
TOXIC SENSOR ONLY	>16	>16
PID	>16	>16
PID + PUMP	>16	>16

### DATA LOGGING

Optional data logging allows gas values, summary logs and calibration details to be logged at regular intervals and later downloaded to a Personal Computer (PC).

Data logging is available as an option when ordering. It cannot be retrofitted without returning the instrument to Ion Science Inc.

Note: If the Data logging option is selected, refer to 'CONFIGURATION HANDBOOK' for further information on data logging and overwriting set up options.

#### ***Viewing Data Logged Readings***

Data logged readings can be downloaded from the instrument into a PC using software and communication adaptor. Contact our Sales Department at Ion Science Inc for further details.

## Introduction

### HYDROPHOBIC TYPE FILTER(S)

A hydrophobic filter would normally be fitted to the instrument but may be removed in certain applications, for example, when the instrument is used to detect Chlorine or other reactive gases. The filter(s), if fitted, should be checked regularly and replaced if contaminated.

See 'FILTER REPLACEMENT' in Chapter 4, 'OPERATOR MAINTENANCE', for further information.

### CONSTRUCTION

The instrument is housed in a tough, impact resistant moulded case. The instrument is sealed to IP65 and the sensing elements, sample inlet and charging socket sealed to IP54. The instrument withstands physical impact testing to EN 61779.

### IDENTIFICATION LABEL

Each instrument has a unique serial number that appears on the label along with the instrument's certification details. This serial number also appears on the instrument display after switch on, during warm-up.

### PHYSICAL PROPERTIES

Weight: 0.4 kg

Dimensions: 140 x 85 x 45 mm.

### Environment

Temperature Limits -20°C to + 50°C Humidity: 0 to 95% R.H. non-condensing.

### Typical Flow Rate Information

Pumped Instruments: Nominal pump flow rate is 0.5 to 0.7 litres per min. Max. 30 metres (97ft.) sample line.

Typical flow fail rate is 0.1 to 0.2 litres per min.

### Warm-up / Stabilization Time

< 40 seconds.

### Response Time (T<sub>90</sub>)

Typical Oxygen (O<sub>2</sub>) response time: < 10 seconds.

### CERTIFICATION

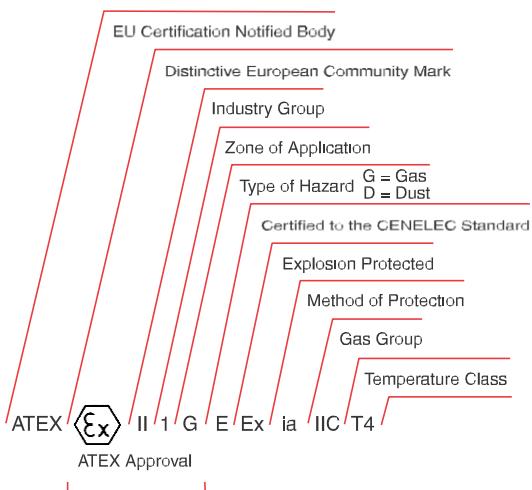
The LEO instrument is certified as follows:

ATEX  II 1 G EEx ia IIB T3 or

ATEX  II 2 G EEx ia d IIC T3 or

ATEX  II 2 G EEx ia d IIC T4

### Identification of Symbols



Certification No. DEMKO03 ATEX  
133803X EEx ia IIB T3

Sira 05 ATEX 2295  
EEx ia d IIC T3 or EEx ia d IIC T4

 0038/YY Marine Equipment  
Directive (Module B&E)

 (European mark of Conformity)

## **Introduction**

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### **PERFORMANCE**

This apparatus conforms to standard EN 50104. Complies with:  
EN 61779 (Flammable)  
EN 45544 (Toxic)

Classified as to intrinsic safety only:

### **WARNING**

The instrument is not for use in Oxygen enriched atmospheres.

### **WARNING**

Rechargeable battery pack must be recharged and replaced in a non-hazardous area.

### **WARNING**

To prevent ignition of flammable or combustible atmospheres, disconnect power (i.e. remove battery pack) before servicing.

### **WARNING**

Replace battery pack only with Part No. 66056 ; 66210 or 66335.

### **WARNING**

To reduce the risk of explosion, do not mix new batteries with used batteries, or mix batteries from different manufacturers.

## **Operation**

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### **OPERATING PROCEDURE**

Check the following:

- The instrument is clean and in good condition
- The battery pack is in good condition, fully charged and fitted correctly
- The hydrophobic filter, if fitted, is clean and in good condition
- The sample line and any other accessories used are in good condition and leak-free
- All gas ranges are operational and the instrument is zeroed
- The instrument is within the calibration period you have decided is necessary for your application.

Each time you use the instrument carry out the following procedure:

**Caution:** The LEO can be supplied with a flammable gas sensor. This sensor is designed for use in concentrations of gas not exceeding the Lower Explosive Limit (LEL). Exposing the sensor to high concentrations of flammable gas above the LEL can cause damage to the sensor and inhibit its proper operation. The LEO has an inbuilt safety alarm feature to prevent this. Refer to ALARMS section of this handbook for details.

- Switch instrument on in fresh air and check that the battery pack is charged
- Check there are no faults
- Attach optional accessories, as required
- If oxygen sensor is fitted, check oxygen readings to ensure correct operation. The oxygen sensor responds to the user breathing on the instrument front grille by displaying a decreased value, i.e. below 20.9%.
- Switch the instrument off, in fresh air, after use.

### **SWITCHING THE INSTRUMENT ON**

Press and hold the green Right Hand (RH) button for one second to switch the instrument on.

The instrument begins its warm-up routine, which lasts 30 seconds. During the warm-up, a countdown timer appears in the top (RH) corner of the display.

**Note:** The display backlight illuminates and remains on during warm-up. When warm-up is completed, the screen light automatically switches off.

## Operation

### Instrument Identification

During warm-up, the instrument display identifies the model, serial number, software version, data logging option and battery status information as shown in Fig. 2.2:



Fig. 2.2 Instrument Identification

Note: The instrument configuration may not include data logging, if required, it can be retrofitted by Ion Science Inc at a later date. Contact Ion Science Inc. for details.

### Battery Status

Provides the user with the Battery charge level, as shown in previous display. This will be indicated by a battery symbol with a bar graph showing FULL, 75%, 50% and 25%, which is shown for approximately five (5) seconds during warm up, then on the top of the display during normal operation.

### Time and Date

The time and date from the instrument's built-in clock is displayed on the screen during warm-up, as shown in Fig. 2.3.

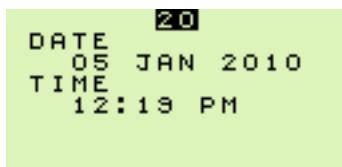


Fig. 2.3 Time and Date

If data logging is being used, the time and date is set from this clock. This may be important when viewing the logged data.

### Calibration Due Date

The calibration due date appears on the display, as shown in Fig. 2.4. A configurable option is available not to display this screen.



Fig. 2.4 Calibration Due Date

If the Calibration Due Date has expired, the audible and visual alarm activates and the screen, as shown in Fig.

2.5, is displayed during warm-up:



Fig. 2.5 Calibration Expired

## Operation

Press and hold the green (RH) button once, to acknowledge the calibration due date is overdue, cancel the audible / visual alarm, and continue to the next display.

A configurable option is available to force the user to switch off the instrument.

Note: Further details are available in 'CONFIGURATION HANDBOOK'.

### Select Calibration Gas

This configurable option is available to allow the user to select a different flammable gas from that which was originally used to calibrate the instrument.

This action allows the instrument software to compensate and thus display more accurate readings when detecting the re-selected gas type.

When this option is displayed, as shown in Fig. 2.6, the gas that was originally used to calibrate the instrument is identified between two arrowheads.

Note: The instrument calibration certificate also identifies the original calibration gas type.

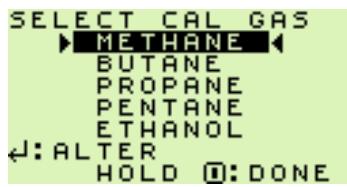


Fig. 2.6 Cal Gas Selection

To select a different gas type, press the yellow Left Hand (LH) button to scroll through the available options from Methane, Butane, Propane, Pentane and Ethanol.

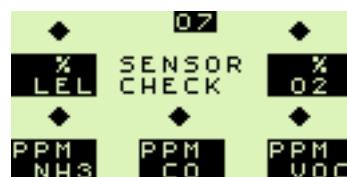
When the required option is highlighted, press and hold the green (RH) button to select.

Note: Accuracy for the re-selected gas type is + 20%.

### Sensor Confirmation Check

The symbol ◆ appears above each sensor type to confirm that the sensor has been recognised, is working correctly, and is being zeroed. When sensors are zeroed correctly, a symbol ✓ appears above each sensor.

Refer to Fig. 2.7 for example.



followed by

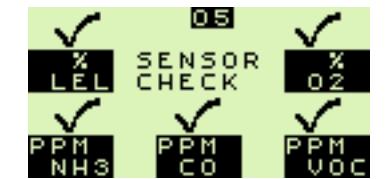


Fig. 2.7 Sensor Check Displays

If sensor(s) fail the zero check at the end of warm-up, the audible and visual alarm activates and the instrument display will show a spanner symbol and pause, as shown in Fig. 2.8:

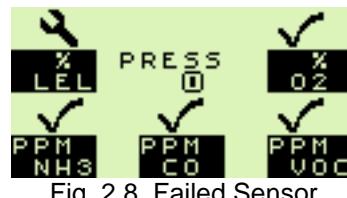
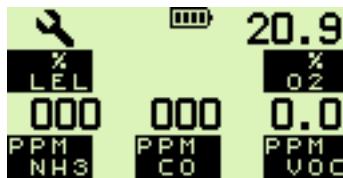


Fig. 2.8 Failed Sensor

## Operation

To acknowledge the alarm, press the green (RH) button once. This will clear the audible / visual alarm and display a flashing spanner symbol, \*alternating with the faulty sensor zero reading (\*LEL sensor only). An example is shown in Fig. 2.9:



alternating with

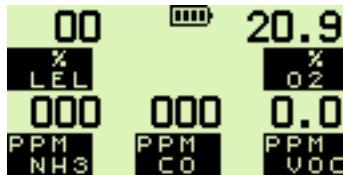


Fig. 2.9 Acknowledge Alarm

A configurable option is available to force the user to switch the instrument off if a zero fault is detected, as shown in Fig. 2.10:

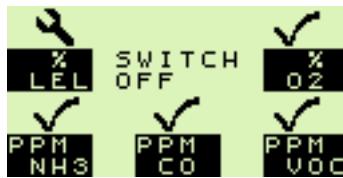


Fig. 2.10 Switch OFF

Note: If a sensor fault is detected during normal operation of the instrument, an audible / visual alarm is activated immediately and a spanner symbol is shown adjacent to the faulty sensor type in the display.

### Normal Operating Display

When warm-up is completed successfully, the screen light switches off and the normal operating display is shown, as in example Fig. 2.11:



Fig. 2.11 Normal Operating Display

Each gas the instrument can measure is shown in the display. In the previous example, the instrument is a five gas model that can measure LEL, Oxygen (O<sub>2</sub>), Volatile Organic Compounds (VOC), Carbon Monoxide (CO) and Ammonia.

Note: The instrument display varies for each model as one, two, three, four or five gas. Versions measuring a range of different gases are available.

### SWITCHING THE DISPLAY BACKLIGHT ON / OFF

The display screen light can be manually switched on when surveying in poor lighting conditions.

Press the green (RH) button once to switch the screen light on. It remains on for 20 seconds and then automatically switches off.

## Operation

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### VIEWING THE MAXIMUM AND MINIMUM RECORDED VALUES SINCE SWITCH ON

The instrument records the maximum and minimum gas values for each sensor, since switch-on. To view max / min values, proceed as follows:

- 1) Start from the normal operating display shown in Fig. 2.12. Press the green (RH) button once to switch the instrument screen light on.

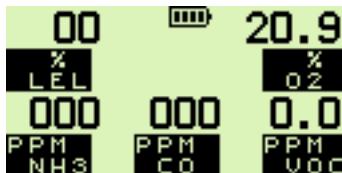


Fig. 2.12 Normal Operating Display

Press the green (RH) button again, while the screen light is on, to view the maximum gas values stored in the instrument.

The example shown in Fig. 2.13 illustrates the maximum gas values stored in a five gas instrument: LEL, Oxygen (O2), Volatile Organic Compounds (VOC), Carbon Monoxide (CO) and Ammonia.

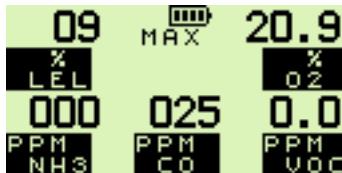


Fig. 2.13 Maximum Gas Values

- 2) Press the green (RH) button again to view the minimum gas values stored in the instrument. Note: This screen is only displayed when an Oxygen sensor is fitted in the instrument.

The following example, Fig. 2.14, illustrates the minimum gas values stored in a five gas instrument: LEL, Oxygen (O2), Volatile Organic Compounds (VOC), Carbon Monoxide (CO) and Ammonia.



Fig. 2.14 Minimum Gas Values

- 3) After these readings have been noted, they can be removed from the memory by pressing and holding the green (RH) button for two (2) seconds if the instrument is clear of all alarms.

This will return the instrument to the normal operating screen. If a new set of readings are required, return to paragraph (1).



Fig. 2.15 Normal Operation

Note: The maximum and minimum values are cleared from the instrument's memory when you press and hold the green (RH) button in non-alarm state. The display returns to the normal operating display if no button is pressed.

## Operation

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### ALARMS RESET OR ACKNOWLEDGE

When the instrument detects an alarm set point has been reached, the audible and visual alarm will be activated to alert the user.

Caution: Never remove the battery to silence an alarm as this can damage the instrument.

The alarms are individually programmable to be either Latching, (i.e. alarm will stay on until the user resets by a press and hold of the green (RH) button when the gas reading has returned within the preset alarm limits), or Non-Latching (i.e. the audible and visual alarm will reset automatically when the reading returns within the preset alarm limits).

Note: Default alarms are set in accordance with current international standards.

ALARM TYPE	LATCHING Y(es) or N(o)	MUTE Y(es) or N(o)	AUDIBLE INDICATION	VISUAL (RED LED) INDICATION
LEL 1 (Hi)	Disabled	Disabled	High Pitch Tone	All Slow Flashing
LEL 2 (Hi Hi)	Y	N	Continuous Warble	(2) Inner / Outer Siren Flash
O 1 (Hi Hi)	Y	N	Continuous Warble	(2) Inner / Outer Siren Flash
O 2 (Lo)	Disabled	Disabled	High Pitch Tone	All Slow Flashing
O 3 (Lo Lo)	Y	N	Continuous High Pitch Warble	(2) Inner / Outer Siren Flash
Toxic 1 / VOC (Hi)	Disabled	Disabled	High Pitch Tone	All Slow Flashing
Toxic 2 / VOC (Hi Hi)	Y	N	Continuous High Pitch Warble	(2) Inner / Outer Siren Flash
Toxic 3 / VOC (STEL)	Y	N	Continuous High Pitch Warble	(2) Inner / Outer Siren Flash
Toxic 4 / VOC (LTEL / TWA)	Y	N	Continuous High Pitch Warble	(2) Inner / Outer Siren Flash
Low Battery Fault	N / A	N / A	Low Pitch Tone	All Slow Flashing
Zero Fault	N / A	N / A	Low Pitch Tone	All Slow Flashing
Sensor Fault	N / A	N / A	Low Pitch Tone	All Slow Flashing
Sample Fault (Pumped Instr. Only)	N / A	N / A	Low Pitch Tone	All Slow Flashing
Low Flow (Pumped Instr. Only)	N / A	N / A	Low Pitch Tone	All Flashing
Calibration Required	N / A	N / A	Low Pitch Tone	All Slow Flashing
Calibration Expired	N / A	N / A	Low Pitch Tone	All Slow Flashing
Over Range (LEL)	Y	N / A	Continuous Wail	All Fast Flashing

N / A = Not Applicable

Table 2.1 LEO Alarms

A configurable option is available that disables user ability to mute the audible alarm only.

## Operation

### Confidence Signal

During normal operation, the instrument sounds a confidence beep and illuminates the green LED's briefly every 15 seconds. This function is programmable in the instrument setup software. This function makes the user aware that the instrument is operating correctly:

Note: The confidence beep and/or LED's can be disabled. See the 'CONFIGURATION HANDBOOK' for further information.

### SWITCHING THE INSTRUMENT OFF

Press and hold both the yellow Left Hand (LH) button and the green (RH) button together to switch the instrument off.

The instrument screen will now start a countdown from three (3) to OFF. Both buttons must be pressed together until the display goes blank.

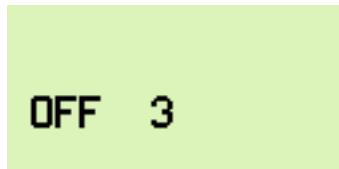


Fig. 2.16 Switch OFF

While both buttons are pressed, the audible alarm sounds every second to alert the user that the instrument is switching off.

### REMOTE SAMPLING (with pump option)

Warning: When making VOC measurements, use only (supplied) Viton sample line as other sample lines may absorb VOC's thus resulting in incorrect readings.

Warning (Hand Aspirator): The LEO is primarily designed to be used with a built-in pump for remote sampling. The hand aspirator can be used for indicative sampling, but it must be noted that when using a hand aspirator, a reading error in the region of +

20% is possible. In addition, whereas the pump can sample quickly and accurately with up to 30 metres of sample line, the hand aspirator must only be used with up to 10 metres of sample line and the sample time is extended. The sample line must be intact and the proper flow established.

Remote sensing is carried out with the inbuilt electric pump option, or by the hand aspirator for non-reactive gases, using the sample connector at the bottom of the instrument and sample tubing supplied with your instrument. On pumped models the pump is off after start-up.

### Pump Option

Press and hold the green (RH) button to start or stop the pump. The pump will run at normal speed for remote sampling.

When the pump is running at normal speed, a pump symbol  rotates in the display as shown in Fig. 2.17

Note: It is only possible to switch the pump ON / OFF when instrument alarms are inactive.



Fig. 2.17 Pump Symbol Displayed

## **Operation**

### ***Assisted Diffusion Option***

If assisted diffusion is the configured option, after instrument warm-up, the pump remains ON at low speed. This setting is used for reactive gases (\*see note).

A press and hold of the green (RH) button re-sets the pump to run at normal speed. When the pump is running at normal speed, a pump symbol  rotates in the display as illustrated in Fig. 2.17. Press and hold the green (RH) button again to switch the pump OFF.

A further press and hold of the green (RH) button re-sets the pump to run at low speed.

\* Note: Ion Science Inc strongly recommend that pumped instruments, configured with reactive gases, use assisted diffusion mode in preference to diffusion mode.

Note: It is only possible to switch the pump ON / OFF when instrument alarms are inactive.

## Alarms

---

### **GAS ALARMS**

Gas alarms are enabled when the instrument is switched on.

Note: Alarms are disabled during warm-up.

All gas ranges have alarm limits that trigger the alarm if the measured gas value exceeds the set level. If a preset alarm level is exceeded, the audible alarm sounds, the LED's flash RED and the gas range in alarm flashes on the display.

#### ***Flammable LEL Alarm Limit***

Up to two (2) alarm levels are programmable, each with different pitch and tone. All alarms are user configurable to meet the specific needs of different companies.

#### ***Over-Range Flammable Gas Alarm Function***

The flammable sensor is designed for use in the LEL range only. Exposure to high concentrations of flammable gas, such as lighter fuel, can damage the flammable sensor. If the flammable gas readings exceed 120% LEL, a safety alarm will be activated. The instrument must now be switched off and returned to clean air.

#### ***Oxygen (O<sub>2</sub>) Alarm Limits***

Up to one (1) upper and two (2) lower alarm limits are programmable, each with different pitch and tone. All alarms are user configurable to meet the specific needs of different companies.

#### ***Toxic Alarm Limits***

When operating normally, the instrument records minimum and maximum readings for each gas and calculates the Short Term Exposure Limit (STEL) and Long Term Exposure Limit (LTEL), known as Time Weighted Average (TWA) readings, for each toxic gas range as appropriate. Up to two (2) instantaneous and two (2) TWA alarms are programmable for each toxic range fitted to the instrument.

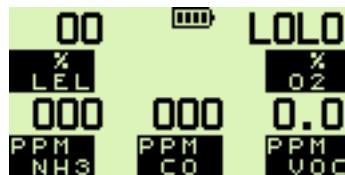
Note: A Time Weighted Average (TWA) value is the mean average gas level over a specific period. The STEL is 15 minutes and the LTEL is 8 hours. In accordance with UK legislation, this requires the time weighted averages to be averaged over a full 24 hour period whether the instrument is On or Off. Such averaging essentially makes the instrument single user applicable. The option is available to restart the averaging after each instrument switch-off, thus allowing for multiple user application.

All alarms are user configurable to meet the specific needs of different companies.

Note: The toxic gas alarm levels – instantaneous, STEL and LTEL are set at the time of instrument manufacture. It is important that the user ensures that the levels are in accordance with their company's alarm levels and with health and safety legislation. The alarm levels may be changed, if required, via the instrument set up software, or as detailed in the 'CONFIGURATION HANDBOOK'.

## Alarms

In the following two examples, Fig. 3.1 shows a five-gas instrument signalling a 'Lo Lo' Oxygen alarm and Fig. 3.2 shows a five-gas instrument signalling a 'Hi Hi' LEL alarm. If more than one gas alarm level is exceeded, the gas value will flash for each gas type in alarm.



toggles to



Fig. 3.1 'LoLo' Alarm



toggles to



Fig. 3.2 'HiHi' Alarm

Each alarm can be latching or non-latching. Latching alarms must be cleared by the user when the gas level returns to within the preset alarm limits. Non-latching alarms clear automatically when the gas level returns to within the preset alarm limits.

Note: See the 'CONFIGURATION HANDBOOK' for further information.

### 3.2 Acknowledge Gas Alarms

Caution: Never remove the battery to silence / mute an alarm as this can damage the instrument.

Once in a safe gas free area, or the gas reading has returned within the preset limits, press and hold the

green (RH) button to silence / mute the alarm sounder and extinguish the gas LED's.

Mute 'enabled' silences alarm for 60 seconds.

Mute 'disabled' cannot silence the alarm until gas falls below alarm level.

If alarm configuration allows muting of audible alarm,

(Refer to table in paragraph 'ALARMS RESET OR ACKNOWLEDGE'), the following applies:

Non-latching: Once alarm has been muted, the audible alarm is cancelled for a period of 60 seconds, and if gas concentration during that time falls below alarm set point, the visual alarm clears automatically.

Latching: If audible alarm has been muted and if gas concentration during that time falls below alarm set point, visual alarm requires to be acknowledged to clear.

## Alarms

### HIGH FLAMMABLE GAS OVER-RANGE ALARM

Caution: Exposing the LEL sensor to concentrations of flammable gas above 100% LEL can damage the sensor.

In order to protect the user from danger in the event of the flammable gas (LEL) sensor being over exposed to a high concentration of flammable gas, the instrument has an over-range alarm.

If the LEL sensor is exposed to a gas reading above

120% LEL, the displayed value will change to four (4) rising arrows, the tone of the audible alarm will change, and the visual alarm will flash quickly. The flashing message 'DANGER' toggles with 'OVER RANGE', as shown in Fig. 3.3:



toggles to



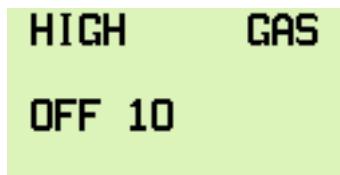
Fig. 3.3 Over Range Alarm

The instrument must be returned to a gas free area or sample clean air. The instrument must now be switched off.

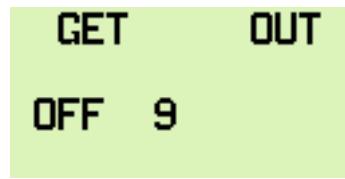
Note: To avoid accidental switch-off in the dangerous state, the off cycle is increased to 10 seconds.

Switch off by a press and hold of both buttons together.

A count timer, from 10 seconds to zero, will appear on the display together with the message 'HIGH GAS' alternating with 'GET OUT', as shown below:



Then



and so on, alternating until zero is reached

Fig. 3.4 'High Gas' / 'Get Out' Timer

## Alarms

After switching the instrument off, when the flammable sensor has been exposed to potentially damaging high flammable gas concentrations, it is important that the instrument is only switched on again in clean fresh air.

### FAULT ALARMS

Refer to Alarms Table, on page 2-14 of this handbook, to identify the audible / visual indication for any of the following faults.

#### Low Battery

The “LOW  BATTERY” flag is displayed, intermittently on the screen, when the instrument’s battery power is low (i.e. approximately 30 minutes operating time remaining). The audible alarm sounds, once every two seconds, and the Red LED’s flash. Recharge the battery or replace the alkaline batteries if using alkaline batteries.

The “BAT  FAULT” flag shows constantly when approximately three (3) minutes operating time remains. The audible alarm sounds continuously and the Red LED’s illuminate constantly. After three (3) minutes the instrument automatically switches off.

Note: Both audible and visual gas alarms continue to operate after the low battery warning message, “LOW  BATTERY”, appears.

#### Zero Fault

Note: For instruments with CO2 sensor fitted, refer to paragraph 3.4.3 for details.

A “ZERO FAULT” flag and a flashing spanner symbol  appears after warm-up if the instrument is switched on in the presence of gas or the instrument has been unable to zero all sensors correctly.

The audible alarm sounds, once every two seconds, and the Red LED’s flash.

It is strongly recommended the instrument is returned to a gas free area. Switch the instrument off and then switch on again in clean air. If the fault persists, return the instrument for service.

The instrument can however still be used to detect and alarm on the other sensor(s) fitted. Press the green (RH) Button, as per the screen prompt, to continue.

The faulty sensor will cause the instrument to display a flashing spanner symbol to warn the user that this sensor is not working correctly, as shown in Fig. 3.5:



alternating with

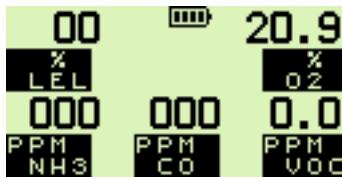


Fig. 3.5 Zero Fault

Note: The flashing spanner symbol will only alternate with the faulty sensor reading in the LEL range. If this occurs, the instructions in section 3.4.3 ‘Sensor Fault’, paragraphs (2) and (3), should be followed.

## Alarms

### Zero Fault

Only applicable to instruments with CO2 sensor fitted

If a CO2 range spanner symbol  appears after warm-up, as illustrated in Fig. 3.6, together with the audible alarm sounding once every two seconds, and the Red LED's flashing, the instrument has been switched on in the presence of gas or the instrument has been unable to zero the CO2 sensor correctly.

It is strongly recommended the instrument is returned to a gas free area. Switch the instrument off and then switch on again in clean air. If this is not possible / convenient, the alarm can be acknowledged and the instrument can still be used to detect CO2 gas.



Fig. 3.6 CO2 Sensor - Zero Fault

Press the green (RH) button to acknowledge CO2 alarm and continue using instrument.

Note: If a "ZERO FAULT" flag is displayed together with a flashing spanner symbol on any of the other sensors, follow instructions detailed in paragraph 3.4.2.

The faulty CO2 sensor will cause the instrument to display a flashing 'ZERO FAULT' flag alternating with a gas value to warn the user that this sensor is not correctly zeroed, as shown in Fig. 3.7:



Alternating with



Fig. 3.7 CO2 Sensor - Zero Fault

### Sensor Fault

There are three types of sensor fault as illustrated in the following displays:

1) If a "ZERO FAULT" flag and a spanner symbol appears above gas type, as shown in Fig. 3.8, then the sensor requires replacement or an electrical fault exists. Return instrument to an approved Service / Repair facility.

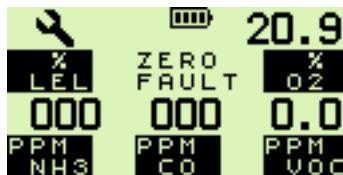
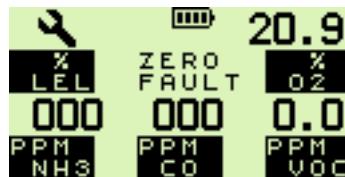


Fig. 3.8 Sensor Fault

## Alarms

- 2) If a “ZERO FAULT” flag and a flashing spanner symbol appear, alternating with a zero LEL reading as shown in Fig. 3.9, apply test gas for two minutes to allow the display to return to zero then switch instrument Off and On again. If fault remains, return instrument to an approved Service / Repair facility.

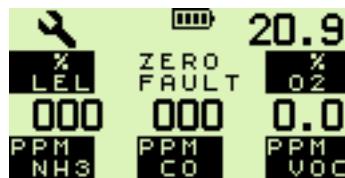


alternating with



Fig. 3.9 Check Fault

- 3) If a “ZERO FAULT” flag and a flashing spanner symbol appear, alternating with an LEL gas value as shown in Fig. 3.10, leave instrument on for 30 to 60 minutes then switch instrument Off and On again. If fault remains, return instrument to an approved Service / Repair facility.



alternating with

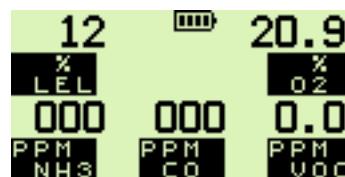


Fig. 3.10 Check Fault

### Sample Fault

(Pumped Instruments Only)

If the pump symbol changes to the symbol shown in Fig.

3.11, a “FLOW FAULT” flag is displayed and an audible alarm and Red LED's are activated, then a sample fault or flow fail exists.

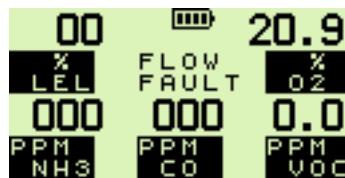


Fig. 3.11 Sample Fault

Check sample line, sample filter or probe for blockage, if applicable. Clear blockage then restart the pump by a press and hold of the green (RH) button.

## Alarms

### Low Flow

Only applicable to pumped instruments supplied with this option.

Note: Feature is automatically disabled if air temperature is below 5°C (41°F)

If a "LOW FLOW" flag flashes in the display and an audible alarm and Red LED's are activated, then a low flow exists. In this alarm condition, the pump symbol is not displayed. Refer to example Fig. 3.12.

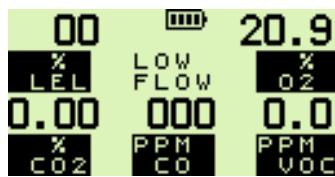


Fig. 3.12 Low Flow

Check maximum sample line length (30 metres) is not exceeded, check sample filter or probe for blockage, if applicable.

### Calibration Expired

During normal operation of the instrument where the calibration date has expired, a 'CAL DUE' warning flag will flash on the display every 30 seconds to alert the user of the fact that the expiry date has been exceeded.

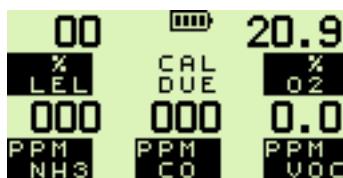


Fig. 3.13 Calibration Expired

### Calibration Required

During warm-up, if the 'CALIBRATION REQUIRED' flag is displayed and an audible alarm and Red LED's are activated, the instrument has detected a fault in the calibration memory during start-up and is unable to continue without re-calibration.



Fig. 3.14 Calibration Required

The instrument must be switched off immediately. Follow appropriate action required by your company for calibration.

## **Operator Maintenance**

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### **CLEANING**

**CAUTION:** Do not use polishes containing silicon or solvent to clean the instrument as these may damage the flammable gas sensor (if fitted). Do not use abrasive materials or strong volatile chemical solutions as these could damage the impact resistant casing.

The outer, impact resistant, rubber casing of the LEO instrument may be cleaned using a non-abrasive moist cloth. Rub the cloth over the outer casing to remove any dirt and grime.

In extreme cases, a mild soap solution may be used with a non-abrasive cloth to remove more stubborn marks.

### **FILTER REPLACEMENT**

The instrument has two filters protecting the instrument sensors. The Sensor Grille (Hydrophobic) Filter is located behind sensor grille on front of the instrument and the Sample Inlet (Dust) Filter is located in the sample inlet connector at the bottom of the instrument. The filters should be inspected periodically for signs of damage.

To inspect / replace the filters, proceed as follows:

#### ***Sensor Grille Filter***

- 1) Unscrew the cover screw, in a counter clockwise direction, using the Battery / Sensor Grille Key (Part No. 66166), then remove the cover by sliding it away from the instrument and up towards the display screen.
- 2) Fit a new Sensor Grille Filter (Part No. 66083), if required.  
Note: The filter is keyed and therefore can only be fitted in one direction.
- 3) Replace the sensor cover assembly by first positioning the location feet, then pressing the cover down on to the filter.
- 4) Replace and secure the cover screw, in a clockwise direction, using the Battery / Sensor Grille Key (Part No. 66166).

Note: Care must be taken not to overtighten the cover screw.

#### ***Sample Inlet Filter***

- 1) Unscrew the two (2) retaining screws, in a counter clockwise direction, using the Inlet Filter Key (Part No. 66165), then remove the sample line connector.
- 2) Push the sample inlet filter disc out by inserting the hexagonal key into the sample nozzle. Refer to image on next page.
- 3) Fit a new Sample Inlet Filter (Part No. 66084).
- 4) Replace the sample line connector. The sample line connector is moulded to fit in one direction only. Make sure that it is the correct way round to slip easily into the instrument.
- 5) Replace then tighten the two retaining screws, in a clockwise direction, using the Inlet Filter Key (Part No. 66165).  
Note: Care must be taken not to overtighten the screws.

## Operator Maintenance

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### ***In-line Hydrophobic Filter (Accessory)***

The in-line hydrophobic filter assembly consists of the filter and a luer fitting on one side of the filter and a slide-on connection on the other, and is available as an accessory (Part No. 66485). The filter assembly is used to protect the instrument from the ingress of water when sampling in moist conditions.

The filter is located between two lengths of 'Tygon' tubing (Part No. 66118) and attached to the instrument via a Sample Line Connector (Part No. 66045) as illustrated in Fig. 4.5.

To replace the filter, proceed as follows:

- 1) Unscrew the luer fitting from one side of the filter in a counter clockwise direction, detach the tubing from the other side then remove the hydrophobic filter.

Note: If re-fitting the same filter, make sure that filter direction of flow orientation is maintained. This can be easily identified by position of yellow label on filter, i.e. facing instrument.

- 2) Fit a new In-line Hydrophobic Filter (Part No. 66484).

Note that the filter should be fitted with the yellow label facing the instrument.

- 3) Attach the luer fitting, with sample line attached, to the mating side of the filter then tighten in a clockwise direction to secure. Do not overtighten the fitting.

- 4) Attach the sample line to the other side of the filter making sure that it is securely fitted.

### **BATTERY PACKS**

Battery packs provide the instrument with the power it requires to operate.

Three types of battery pack are available: Long Duration, Fast Charge and Alkaline.

Each type of pack provides a different operational lifetime. These times can be found in Table 4.1 and display battery life in hours, allowing five (5) minutes of alarm per day.

INSTRUMENT OPERATING MODE	BATTERY TYPE / LIFE	
	LONG DURATION / FAST CHARGE	ALKALINE
LEL	>16	>16
IR (INFRARED)	>16	>16
PUMP	>16	>16
LEL + IR	12	13
LEL + PUMP	12	13
IR + PUMP	15	>16
LEL + IR + PUMP	9	10
TOXIC SENSOR ONLY	>16	>16
PID	>16	>16
PID + PUMP	>16	>16

Table 4.1 Battery Life

## Operator Maintenance

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The battery pack should be recharged (rechargeable battery pack), or the batteries replaced (alkaline battery pack), in the following situations:

- The 'Low Battery' flag  appears on the display.
- The instrument will not switch On.

When the 'Low Battery' flag appears on the display, there is approximately 30 minutes operation left at normal temperatures. The instrument will then switch Off automatically.

The '**Long Duration**' battery pack can be charged using the following chargers:

Standard Charger: The battery pack can be removed from the instrument then connected to the standard charger or, it can be charged while fitted to the instrument.

5-Way / 10-Way Standard Charger: The battery pack(s) can be removed from the instrument(s) then connected to the standard charger lead(s) or, it / they can be charged while fitted to the instrument(s).

12V / 24V Vehicle Charger: The battery pack can be removed from the instrument then connected to the vehicle charger or, it can be charged while fitted to the instrument.

Fast Charger: The battery pack must be removed from the instrument then 'docked' the fast charger.

10-Way Fast Charger with (up to 9) Slave Unit(s): The battery pack(s) must be removed from the instrument(s) then 'docked' the fast charger / slave unit(s).

The '**Fast Charge**' battery pack can be charged using the following chargers:

Fast Charger: The instrument can be docked in the fast charger with the battery pack fitted or, the battery pack can be removed from the instrument then 'docked' in the fast charger.

10-Way Fast Charger with (up to 9) Slave Unit(s): The instrument(s) can be docked in the fast charger / slave unit(s) with the battery pack(s) fitted or, the battery pack(s) can be removed from the instrument then 'docked' in the fast charger / slave unit(s).

### **Removing and Replacing a Battery Pack**

#### **CAUTION**

- 1) Always switch the instrument off before removing the battery pack.
- 2) Always replace the protective cap in the Long Duration battery pack charging socket before use

#### **WARNING**

- 1) Rechargeable battery pack must be recharged and replaced in a non-hazardous area.
- 2) Replace alkaline / rechargeable battery pack only with genuine Parts

- 1) Unscrew the captive screw, in a counter clockwise direction, using the Battery / Sensor Grille Key (Part No. 66166) as shown in Fig. 4.6.

Note: Long Duration battery pack is fitted with a captive screw and protective cap.

- 2) Pull the battery pack down from the instrument to disconnect, as shown in Fig. 4.7.

3a) **RECHARGEABLE**:

Replace with a fully charged battery pack.

Refer to 'Charging (Rechargeable) Battery Pack', in section 4.3.2.

3b) **ALKALINE**:

Replace alkaline batteries.

Refer to 'Replacing Alkaline Batteries', in section 4.3.3.

- 4) Replace battery pack in instrument. Make sure it is correctly aligned then push connector together.

- 5) Retighten the captive screw, in a clockwise direction, using the Battery / Sensor Grille Key (Part No. 66166).

Note: Care must be taken not to overtighten the captive screw.

- 6) Fit the protective cap in the Long Duration battery pack charging socket before use.

## Operator Maintenance

### Charging (Rechargeable) Battery Pack

There are two (2) types of rechargeable battery pack, as follows:

A 'Long Duration' nickel metal hydride (NiMH) battery pack

(Part No. 66056)

or

A 'Fast Charge' nickel metal hydride (NiMH) battery pack

(Part No. 66335).

Make sure that rechargeable battery packs are recharged using only chargers.

Caution 1: Never attempt to recharge an alkaline battery pack.

Caution 2: Switch the instrument off when charging a battery pack fitted to an instrument.

#### Standard Charger:

The 'Long Duration' battery pack should be left overnight connected to the standard charger to recharge a discharged battery pack. This period may vary depending upon operational conditions such as temperature and the condition of the battery pack in terms of capacity. The battery pack can be removed from the instrument and connected to the charger on its own or it can be charged while fitted to the instrument, as shown in Fig. 4.8.

It is important that the instrument is switched off when charging a battery pack fitted to the instrument.

If the battery pack is fitted to the instrument during charging, the outer two red instrument LED's illuminate for a period of 14 hours, after which time are replaced by the green LED's

Note: This is a timer function only, and does not indicate charged condition of battery pack.

#### 5-Way / 10-Way Standard Charger

This option provides the charging up to five (5) or ten (10) 'Long Duration' rechargeable battery packs simultaneously using standard charger connections and re-charging from one power outlet socket.

The 'Long Duration' rechargeable battery pack can be removed from the instrument or alternatively, can be charged while fitted to the instrument and connected to the 5-Way or 10-Way Standard Charger. (5-Way adaptor option illustrated in Fig. 4-9).

It is important that the instrument is switched off when charging a battery pack fitted to the instrument.

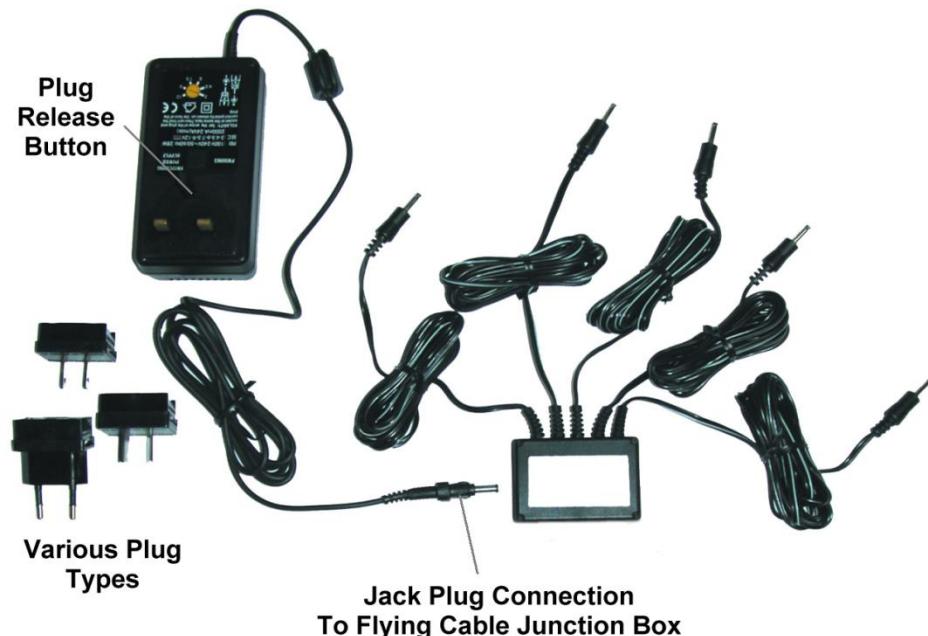


Fig. 4.9 5-Way Charging Adaptor Option

## **Operation Maintenance**

The rechargeable battery packs should be left overnight connected to the Standard Charger to recharge discharged battery packs. This period may vary depending upon operational conditions such as temperature and the condition of the battery packs in terms of capacity.

If the battery pack is fitted to the instrument during charging, a small battery symbol on the LEO screen will display charging operation as a flashing bar graph, also, the outer two red instrument LED's illuminate for a period of 14 hours, after which time are replaced by the green LED's

Note: This is a timer function only, and does not indicate charged condition of battery pack.

### **Fast Charger**

The 'Fast Charge' or 'Long Duration' battery pack can be removed from the instrument and located in the Fast Charger as illustrated below. The 'Fast Charge' battery pack can also be charged while fitted to the instrument by 'docking' the instrument in the Fast Charger as illustrated below. It is important that the instrument is switched off when charging a battery pack fitted to the instrument.

A battery pack will take approximately 31/2 hours to charge from an exhausted condition. Note that the period of charging may vary depending upon operational conditions such as temperature and the condition of the battery pack in terms of capacity. A green LED on the front of the charger indicates 'charging in progress'. This LED is extinguished when charging is complete.

### **10-Way Fast Charger with (up to 9) Slave Unit(s)**

The 'Fast Charge' or 'Long Duration' battery pack can be removed from the instrument and located in the Fast Charger master or slave unit. The 'Fast Charge' battery pack can also be charged while fitted to the instrument by 'docking' the instrument in the Fast Charger master or slave unit. It is important that the instrument is switched off when charging a battery pack fitted to the instrument. A battery pack will take approximately 31/2 hours to charge from an exhausted condition. Note that the period of charging may vary depending upon operational conditions such as temperature and the condition of the battery pack in terms of capacity.

A green LED on the front of the charger master or slave indicates 'charging in progress'. Each LED is extinguished when charging is complete.

### **Replacing Alkaline Batteries**

**Caution:** To be in compliance with the certification regulations of this product, use only alkaline batteries from the following manufacturers:

- Energizer / Energizer Industrial
- Panasonic
- Sony.

**WARNING:** When replacing batteries in the alkaline battery pack, make sure that you are in a safe area and the instrument is switched Off. Do not open an alkaline battery compartment cover or replace the batteries in a hazardous area. Never attempt to charge an alkaline battery pack and never use rechargeable batteries in an alkaline battery pack. To reduce the risk of explosion, do not mix new batteries with used batteries, or mix batteries from different manufacturers.

The alkaline battery pack (Part No. 66210) allows the instrument to be powered using three LR6 (AA) size batteries.

Always switch the instrument Off before changing the battery pack.

- Release the cover plate retaining screw, securing the battery pack cover, by turning it in a counter clockwise direction. Use the Battery / Sensor Grille Key (Part No. 66166).

- Replace the three LR6 (AA) size batteries, as shown in Fig. 4.13.

Note Make sure that the batteries are replaced using correct polarity for + and -

Note: Always use three new LR6 (AA) size batteries. Do not mix old and new batteries.

- Make sure that the batteries are replaced using correct polarity for + and -
- Replace the battery cover plate then tighten the retaining screw in a clockwise direction using the Battery / Sensor Grille Key (Part No.66166).

Note: Care must be taken not to overtighten the retaining screw.

## Calibration

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### **GENERAL DESCRIPTION**

The instrument has been calibrated for particular gases. Where any doubt exists the product should be returned to Ion Science Inc or an authorised distributor for calibration.

**WARNING:** The instrument must be calibrated and configured by authorised personnel only.

Four methods of calibration are possible:

- Field Calibration. See 'CONFIGURATION HANDBOOK ' for further details.
- The Manual Calibration software allows the instrument to be linked to a PC running Calibration software and applying gas manually.
- The Automatic Calibration System provides controlled delivery of gases allowing you to calibrate in a controlled manner and maintain a record of calibration results on a PC.
- The Instrument Management System (IMS) provides all the facilities of the Automatic Calibration System with the added feature of instrument database management.

Note: The detailed calibration methods, consisting of both hardware and software, are manufactured by Ion Science Inc. For more detail contact Ion Science Inc or an authorised distributor.

### **CALIBRATION VALIDITY**

Calibration validity is the responsibility of the user. Under normal operating conditions a 12 month period can be expected. This is no guarantee, however, as the precise application of the product is unknown. Individual codes of practice may dictate shorter periods.

Regular checking establishes a pattern of reliability and enables the calibration check period to be modified in line with operational experience. The higher the risk, the more frequently calibration should be checked.

## Accessories

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Accessories available for PID LEO instrument

### STANDARD ACCESSORIES

Part Number	Description
66123	Hand Aspirator (can be used for non-reactive gases only)
66488	Hand Aspirator (c/w 3.0 metres Viton Tubing)
66489	Viton Sample Line (per metre)
66112	Sample Line Extender (to connect sample lines together)
66142	3.0 metres Viton Tubing (c/w sample connector)
66930	3.0 metres Reactive Gas (e.g. Cl <sub>2</sub> ; NH <sub>3</sub> ) Tubing Kit (c/w sample connector)
66485	In-line Hydrophobic Filter Assy.
66484	Hydrophobic Filter (use with 66485)
66546	Neck & Chest Harness with Clip
66017	Probe Assembly
66545	Ball Float
66349	Carry Case
66165	Inlet Nozzle Filter Key (1.5mm. A/F)
66166	Battery / Sensor Grille Key (2mm. A/F)
66167	Instrument Key
66083	Sensor Hydrophobic Filter
66084	Sample Inlet Filter
66210	Alkaline (Drycell) Battery Pack
66056	Long Duration Rechargeable (NiMH) Battery Pack
66335	Fast Charge Rechargeable (NiMH) Battery Pack
V66194	User Handbook (PID LEO)
66203	Configuration and Field Calibration Instruction Manual CD-ROM

### STANDARD CHARGERS

Part Number	Description
66140	Std. Charger c/w Universal Plug
66200	5-way Std. Charger c/w Universal Plug
66207	10-way Std. Charger c/w Universal Plug
66206	12v / 24v Vehicle Charger Lead

### FAST CHARGERS

Part Number	Description
66513	Fast Charger c/w Universal Plug
66516	10-way Fast Charger (Master Unit) c/w Universal Plug
66514	10-way Fast Charger (Slave Unit). Maximum 9 units per set-up
66510	Fast Charger c/w Data Download Communications Pack
66511	Fast Charger c/w Set-up Communications Pack

## **Accessories**

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### **COMMUNICATION OPTIONS**

Part Number	Description
66208	Data Downloading Package c/w CD-ROM, Communications Adaptor & User Instructions
66300	Data Downloading Package c/w Charger (Universal Plug)
66445	LEOCAL (Calibration) Package c/w CD-ROM, Communications Adaptor & User Instructions
66448	LEOCAL (Calibration) Package c/w Charger (Universal Plug)
66500	Data Downloading & LEOCAL Dual Package c/w 2 x CD-ROM, Communications Adaptor & User Instructions
66501	Data Downloading & LEOCAL Dual Package c/w Charger (Universal Plug)
66209	USB Adaptor - can be used for above items.

Note: The Interface Adaptor replaces the battery pack while calibrating or downloading data from the instrument, therefore, a standard charger is required to power the instrument. If a charger is required, order as appropriate from list.

## **Additional Information**

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### **TRAINING**

Training courses are available.

Contact Ion Science Inc for further details:

T: 877 864 7710

E: [info@ionscienceusa.com](mailto:info@ionscienceusa.com)

### **WORLD WIDE WEB**

Visit Ion Science Inc web site at [www.ionscienceusa.com](http://www.ionscienceusa.com)

## **Instrument warranty and service**

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### **SERVICE**

Ion Science Inc is pleased to offer a number of service options on our Leo product range that allow you to choose the instrument cover that best suits your needs.

At Ion Science we recommend that all of our gas detection instruments be returned for service and factory calibration once every 12 months.

Contact Ion Science or your local distributor for service options in your area.

Find your local distributor by visiting: [www.ionscienceusa.com](http://www.ionscienceusa.com)

### **CONTACT DETAILS**

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**Manual log**

<b>Manual version</b>	<b>Amendment</b>	<b>Issue date</b>	<b>Instrument firmware</b>	<b>PC software</b>
1.0	Original	01/03/2014		